D: REMARKS

The Action was mailed 4 October 2004, and is the first in the present application. No formality objections were entered against the drawings, specification or claims. Twenty claims in all were presented. The Examiner rejected Claims 11, 12 and 17 under 35 USC 102(b) as being anticipated by Shao et al (US-P 6,216,461). Claims 18-20 were rejected under 35 USC 103(a) as obvious over Shao in view of Allansson et al. (US-P 6,427,436). Claims 1-5, 7-10, 13 and 16 were rejected under the same section as obvious over Kitajima et al. (US-P 6,641,501) or Hofbauer (US-P 6,722,458), in view of Shao. Claims 6, 14 and 15 were indicated as directed to patentable subject matter but objected to as depending from rejected base claims.

Claims 1, 5, 6, 10, 11, 13, 17 and 19, including all of the independent claims, have been amended to improve clarity of expression and introduce additional structure highlighting the differences between the claimed invention and the cited art. Claims 7, 8 and 9 have been canceled, the subject matter of the claims having been moved to claims 5 and 6. The Applicant respectfully traverses the rejections of the claims. Claims 1-6 and 10-20 remain active.

In brief, the invention is directed to the reconfiguration of and improved management of an exhaust gas recirculation system for a turbocharged internal combustion engine installed on a motor vehicle. Exhaust gas is to be drawn from the exhaust stack downstream from the power turbine, compressed and inserted into the intake air system after the intake compressor and any intercooler but ahead of the intake manifold. Drawing the exhaust gas downstream from the power turbine is done to allow cooling of the exhaust gas. The exhaust gas compressor is powered, in its preferred form, by an electric motor powered from a battery. A vehicle charging system is used to maintain battery charge, however, charging of the battery occurs primarily during periods when the

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engine is negatively loaded, such as can occur when the vehicle is being stopped or traveling down hill. Under such circumstances, the opportunity is present to use the internal combustion engine as a brake. The load represented by the charging of the battery occurs when the engine is otherwise negatively loaded and thus helps in braking the vehicle. The exhaust gas compressor is then primarily run from power recaptured from stopping the vehicle when the engine is under its greatest positive loads. This relieves the engine of the load of running the compressor. In this way, the exhaust gas compressor, instead of being a net load on the internal combustion engine, becomes a net regenerative boost to the engine by being powered primarily from recaptured electrical power.

The art applied to the claims does not recognize this possibility and does not teach the distinct claim elements directed to the invention within what is otherwise a description of a straightforward exhaust gas recirculation system. Of particular significance here are the omissions of the Shao reference. Shao recognizes that exhaust gas recirculation compressors require a substantial amount of power to run on turbocharged vehicles. Shao states that a "known system provides a pump . . . that creates a pressure differential sufficient to force the desired exhaust-to-intake flow from the exhaust stack into the intake manifold. . . . [t]his requires a significant amount of energy to pump the exhaust from a low or near-zero gauge pressure up to more than the intake manifold pressure. . . . [t]hese known devices tend to substantially sacrifice fuel economy." (See Shao, col. 1, lines 46-54). Shao posits that exhaust gas compressors represent a load on internal combustion engines to be controlled. Hence he proposes instead to draw "exhaust gas from the exhaust manifold instead of the lower-pressure exhaust gas downstream of the exhaust turbine, thereby dramatically reducing an amount of pumping energy needed to deliver the EGR flow." (See Shao, col. 2, lines 29-33). Shao completely misses the possibility that the EGR compressor can become an element in a regenerative system, without the complication of developing a complete hybrid vehicle.

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The Hofbauer and Kitajima references can be dealt with summarily. Both represent hybrid vehicles which use generator/motors for braking and locomotion. Allansson teaches an exhaust gas recirculation system for a turbocharged engine, but inserts the recirculated exhaust gas upstream from the air intake system compressor 11 (see Fig. 1) and thus has no reason for an EGR compressor.

There is no teaching in the Shao and Allansson references which supports combination of the references to produce the present invention. Shao is directed to minimizing the load an EGR compressor imposes on an internal combustion engine in order to force exhaust gas into a pressurized intake manifold. Accordingly he draws the exhaust gas from the exhaust gas at the point where it is at its greatest pressure, accepting the penalties this imposes. Allansson inserts the recirculated exhaust gas ahead of the intake compressor. In the context of Allansson it is desirable to reduce exhaust gas air temperature as much as possible to minimize corrosion effects on the intake compressor 11. See generally paragraph [0005] of the present application where the issues developed by Shaw and Allansson were discussed. The system of Shao has disadvantages in terms of heat retention. Allansson can lead to corrosion of the intake compressor. They represent mutually incompatible approaches to the problems.

The claim series of 17-20 distinguishes over the Shao and Allansson references. Claim 17 provides that an "exhaust gas recirculating conduit" includes an "exhaust gas compressor" with the conduit "being connected to the exhaust pipe". The exhaust pipe is well defined in the claim to be that portion of the exhaust system downstream from the exhaust manifold, a configuration that Shao teaches away from. Claim 19 adds the regenerative aspects of the invention.

With respect to claim 1 and claim 11, the Kitajima and Hofbauer hybrid vehicle patents were modified by Shao. However, none of these references teach that an exhaust

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gas recirculation pump motor can be used in a regenerative system. Claim 1 as originally submitted, although believed to have called out such a system, was felt on rereading to be somewhat indirect. As amended to the claim distinctly recites the regenerative aspects. Claim 2 adds turbocharging to the internal combustion engine system of claim 1, and spells out detail distinct from Shao as to how the exhaust gas recirculation system is configured. Claim 11 tracks more closely the approach taken in claim 17, laying out a configuration of the exhaust gas recirculation system. Claim 13 adds the regenerative aspects of the present invention.

Applicant believes the Claims as amended are in condition for allowance and respectfully requests favorable action by the Examiner.

Respectfully submitted,

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CERTIFICATE OF TRANSMISSION UNDER 37 CFR §1.8

I hereby certify that this **AMENDMENT** is being facsimile transmitted to the Patent and Trademark Office on or before 12/16/04 to **(703) 872-9306.**

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